

Experimental Investigation of Pedal Driven Hacksaw

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Abstract :- The objective of this paper was to design, fabricate and experimentally investigate the working of Pedal Driven Hacksaw(PDH). PDH is working on Slider Crank Mechanism. The experiment was done using PDH and plywood workpieces. The main parts of PDH are hack saw, reciprocating rod welded to the pedal of a bicycle, flywheel, sprocket and chain drive. The hack saw is connected with the reciprocating rod. By pedaling the bicycle the reciprocating rod moves to and fro, the hack saw will be moving with the rod. The plywood to be cut is placed under the hack saw. Thus the plywood can be cut without any external energy like fuel or current. Since this uses no electric power and fuel, this is very cheap and best. The performance of the PDH was compared with Hand Hacksaw at different rpm. The results indicate that the PDH had given better, accurate and faster cuts when compared with hand hacksaw at different rpm. PDH reduces the effort of cutting plywood to a great extent. When compared to the Power Saw the PDH requires only manual power thereby reducing the utility bill considerably. Experimental result shows that cutting depth of about 17 mm can be obtained in one cycle of strokes for around 100rpm.

Keywords: - Pedal Driven Hacksaw, Slider Crank Mechanism.

I. INTRODUCTION

The Pedal Driven Hacksaw (PDH) is working on Slider Crank Mechanism. The PDH is used to cut plywood in small scales. PDH helps to obtain a less effort uniform cutting. It can be used in places where electricity is not available. It is designed as a portable one which can be used for cutting in various places. The main parts of PDH are hack saw, reciprocating rod welded to the pedal of a bicycle, flywheel, sprocket and chain drive. The hack saw is connected with the reciprocating rod. By pedaling the bicycle the reciprocating rod moves to and fro, the hack saw will be moving with the rod. The plywood to be cut is placed under the hack saw on a work piece holder. Thus the plywood can be cut without any external energy like fuel or current. Since this uses no electric power and fuel, this is very cheap and best.

The surveys of the literature regarding the PDH are listed:

Dharwa Chaitanya Kirtikumar [1] designed and developed a multipurpose machine which does not require electricity for several operations like cutting, grinding etc. This is a human powered machine runs on chain drives mainly with human efforts. But if you wanted to operate this machine by electric power this machine can also do that. It has some special attachment so use both human power as well as electric power. The design is ideal for use in the developing world because it doesn't require electricity and can be built using metal base, chain, pulley, rubber belt, grinding wheel, saw, bearing, foot pedal (for operated by human), electric motor, chain socket.

S.G.Bahaley, Dr. A.U. Awate, S.V. Saharkar [2] designed and fabricated a pedal powered multipurpose machine. It is a human powered machine which is developed for lifting the water to a height 10 meter and generates 14 Volt, 4 ampere of electricity in most effective way. Power required for pedaling is well below the capacity of an average healthy human being. The system is also useful for the work out purpose because pedaling will act as a health exercise and also doing a useful work.

Linxu, Weinan Bai, Jingyu Ru, Qiang Li [3] designed and developed an automatically reciprocating pedal powered electricity generator (ARPPEG) in conjunction with the management and control over harvesting the kinetic energy, electricity generation, electric storage and the output of electricity. According to the operation testing results, this system has been proved to be effective in power generation. In view of the simple structure and low costs of this system without territory and time limits, the application of ARPPEG designed by them could open a new path to saving the energy and helping build a new energy society.

This study aims to design and fabricate a pedal driven hacksaw to obtain a less effort uniform cutting and to have a comparison between hand driven and pedal driven hacksaw.

II. EXPERIMENTAL SETUP

II.1. Experimental System

The PDH consists of mainly four parts, the first one is sprockets, the second is the chain, the third and fourth ones are the connecting rod and flywheel. The chain used is simplex chain. The function of a flywheel is to reduce the fluctuations of speed caused by the fluctuation of pedaling and also to provide uniform cutting. Figure 1. shows the pedal driven hacksaw. The pedal driven hacksaw specifications are given in Table1.



Figure 1: Pedal Driven Hacksaw

Table 1: Pedal Driven Hacksaw Specifications

Number of teeth on sprocket wheel	54
Number of teeth on sprocket pinion	27
Speed of rotation of pinion	400 rpm
Speed of rotation of wheel	200 rpm
Chain used	Simplex

II.2. Experimental Procedure

The pedal powered hacksaw set up, has a simple mechanism operate with chain and sprocket arrangement. The chain is placed on the teeth of the wheel and pinion. Pedal and connecting rod are interconnected to each other with the help of bolts. Bearing is provided between the centre of the wheel or pedal and to delivers a smooth running of the hacksaw in to and fro motion during pedaling. The hacksaw is connected to the end of a rod. As by pedaling the wheel, the flywheel connected nearer to the pinion also rotates and to reduce the fluctuation of speed and also provide a uniform cutting. The work piece is placed on the work piece holder, which is to prevent the movement of work piece during cutting. The size and shape of this setup is similar to cycle. Here for reducing the power, loss chain mechanism is used.

III. RESULTS AND DISCUSSIONS

Figure 2. gives the variation of number of strokes with rpm of PDH. It is observed that the number of strokes increases uniformly with the pedal rpm. The variation in the obtained plot is due to errors in observation and due to power transmission losses.

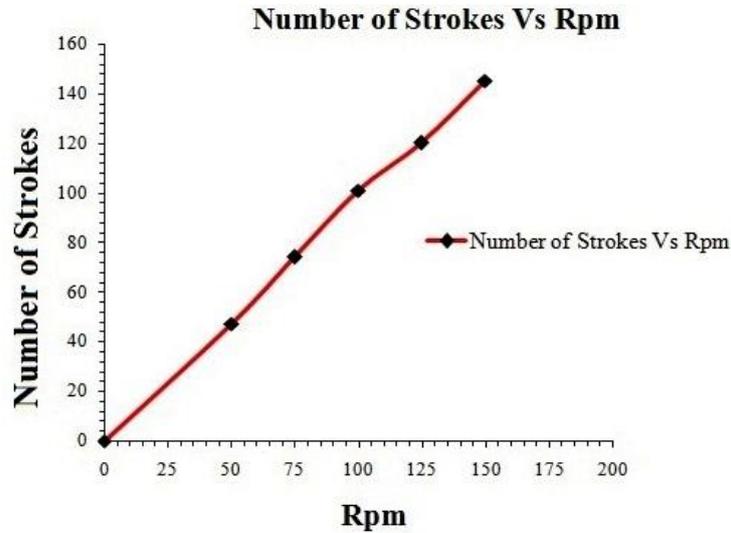


Figure 2: Variation of Number of Strokes with Rpm

Figure 3. shows the variation of cutting depth with rpm of PDH. It is observed that the cutting depth increases with the pedal rpm. Experimental result shows cutting depth of about 17 mm can be obtained in one cycle of strokes for around 100rpm. The variation in the obtained plot is due to errors in observation and due to power transmission losses.

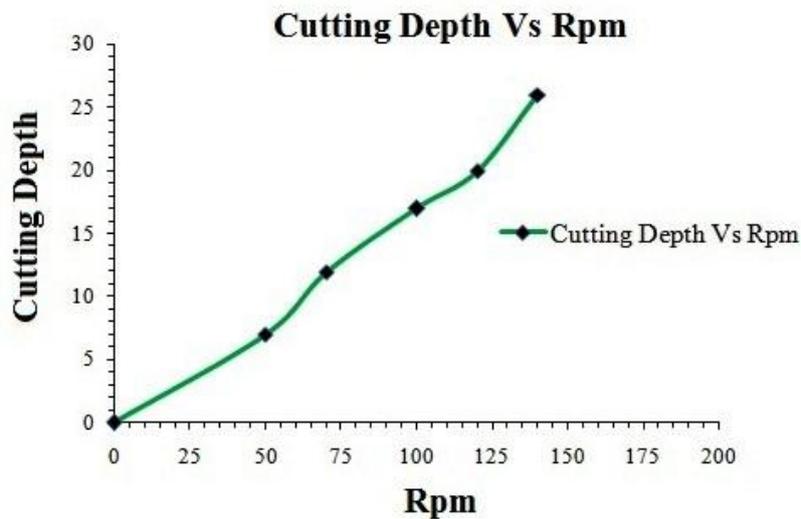


Figure 3: Variation of Cutting Depth with Rpm

IV. CONCLUSIONS

The advantages of using PDH were investigated experimentally. The main conclusions are listed as follows:

- [1]. PDH can be used for light duty cutting operations of plywood.
- [2]. PDH can be used in remote places where electricity is not available. It is designed as a portable one which can be used for cutting in various places.
- [3]. The ply wood can be cut without any external energy like fuel or current. Since PDH uses no electric power and fuel, this is very cheap and best.
- [4]. Experimental result shows cutting depth of about 17 mm can be obtained can be obtained in one cycle of strokes for around 100rpm.
- [5]. Pedal driven hack saw helps to obtain less effort uniform cutting. The results indicate that the PDH had given better, accurate and faster cuts when compared with hand hacksaw at different rpm.

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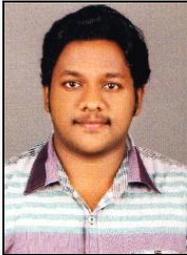
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